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Turning Point Mechanisms in a Dualistic Process Model of Institutional Emergence: The Case of the Diesel Particulate Filter in Germany

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Abstract

Based on an in-depth case study investigating the emergence of a normative institution, namely the diesel particulate filter (DPF) as a de facto standard for diesel cars in Germany, this paper develops a dualistic process model of institutional emergence which reflects the fundamental oppositional character of institutional actors involved in a series of framing contests. The proposed model features distinct phases punctuated by turning point mechanisms that shape the process leading to institutional emergence. Three specific turning point mechanisms were identified: local objectification, movement legitimacy and critical actors taking action. This model provides a novel perspective on institutional emergence in that it explains shifts in contestation and the emergence of an institution as a temporal resolution reached through coercion rather than out of a consensus as several institutionalization models assume. The results also suggest that the industry under attack from a social movement tends to deploy buffering strategies in an attempt to protect itself. Finally, we outline future directions for studying processes around contested fields and turning point mechanisms.

Keywords

buffering strategies, diesel particulate filter, dualistic process model, emergence, framing contest, institution, objectification, social movement, turning point

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Introduction

Institutions do not only emerge to deliver appropriate answers to local problems (Tolbert & Zucker, 1996), they may also arise from intensive collective struggles where activists combine their efforts to challenge existing institutions and propose new ones (Hargrave & Van de Ven, 2006). There is a growing body of literature which acknowledges that social movements can play an important role in institution emergence (Schneiberg & Lounsbury, 2008). They have been found to be a powerful engine in shifting institutional logics in professional settings (Greenwood, Suddaby, & Hinings, 2002; Rao, Monin, & Durand, 2003), forging new institutional logics (Nigam & Ocasio, 2010), legitimating products (Rao, 2002) and new practices (Lounsbury & Crumley, 2007), shaping identity (Markowitz, 2007; Rao et al., 2003), facilitating the emergence of technological standards (Garud, Jain, & Kumaraswamy, 2002), supporting new organizational forms (Rao, 1998; Rao, Morrill, & Zald, 2000; Schneiberg & Soule, 2005) and creating new markets (Fligstein, 1996; King & Pearce, 2010; Sine & Lee, 2009; Weber, Heinze, & DeSoucey, 2008).

Fundamentally, social movements need to mobilize actors and resources in order to change a given situation. At the same time, those who resist the proposed change need to organize in order to protect the status quo. One of the main and most powerful tools that activists can use to attack defenders of the status quo are *collective action frames*, which refers to strategic arguments deployed to mobilize activists (Benford & Snow, 2000). In response, resisters can mobilize defensive arguments. Through collective action frames, activists, resisters and other parties may engage in framing contests; i.e. struggles over meaning (Benford & Snow, 2000; Guérard & Langley, 2012). Yet most of the studies in the extant literature focus on the framing activities of the movement (Davis, McAdam, Scott, & Zald, 2005; McAdam, McCarthy, & Zald, 1996b), without explicitly looking at the resistance and the counter-framing activities of the parties under attack (e.g., Rao et al., 2003; Schneiberg & Soule, 2005; Sine & Lee, 2009; Weber et al., 2008, and see also the comment of Hargrave and Van de Ven, 2006) or, when they have done so, their analysis has been more static rather than process focused (e.g. Creed, Scully, & Austin, 2002; Suddaby & Greenwood, 2005). Consequently, little empirical research has explicitly looked at the framing activities deployed by both the proponents and opponents of new norms or rules and how framing contests evolve and unfold over time to enable institution emergence. As Hardy and Maguire (2008) and Lounsbury and Crumley (2007) remark, the literature has primarily focused on 'actor-centric analysis' where the voices of activists or institutional entrepreneurs have been prominently heard and where the resistance of those under fire has been mainly overlooked.

In order to explore how framing contests evolve over time enabling institutional change, we conducted an in-depth longitudinal case study analysis. We selected the case of the diesel particulate filter (DPF) for diesel cars in Germany because it features extremely dichotomized parties with incompatible goals – namely, the car industry and the environmental movement in Germany. The case is characterized by the mobilization of 97 social movement organizations that were requesting the German car manufacturers to equip diesel cars with DPF in order to reduce pollution. This gave rise to intense framing contests wherein manufacturers largely resisted the proposition of the environmental movement to make the DPF a de facto standard, that is, a standard that is not imposed through regulation but emerges from the bottom up (Abrahamson & Rosenkopf, 1997; Kim & Pennings, 2009). Our analysis focuses on how struggles between proponents and opponents of the DPF evolved over time and how normative institutions emerge. By normative institution we understand 'conceptions of the preferred or desirable' (Scott, 2008, p. 54). Conceptually, we draw on the social movement literature, on institutional theories and on the notion of turning point, which refers to a descriptive term representing 'consequential shifts that redirect a process' (Abbott, 1997, p. 101).

By comparing collective action frames of both parties involved in framing contests, this study contributes to the literature on institutional emergence in three ways. First, we develop a dualistic process model of institutional emergence characterized by deeply grounded opposition between parties involved in a conflict that is reflected in a multiplicity of framing contests and of turning point mechanisms. Dualism refers here to the fundamental opposition between parts of a whole. We show that, in order for the conflict to progress toward the emergence of an institution, frames of the challengers of the status quo must reach a certain threshold in order to become a turning point mechanism. We define *turning point mechanisms* as the critical elements that change the course of a process in a new direction and which are key for the emergence of new institutions, new phases, new conflicts or new events. Three turning point mechanisms are of particular importance in our case: *local objectification, movement legitimacy* and *critical actors taking action*. Second, we show that the party under attack tends to deploy buffering strategies to protect its integrity and to reinforce the status quo. Buffering involves two tactics: disciplining the troops and de-legitimizing the challengers of the status quo. Finally, our results suggest that institutions emerge not only by general consensus, synthesis or objectification, as is often assumed in the literature, but also as a result of the power exercised by critical actors responding to the imperative of the social movement.

The remainder of the paper is structured as follows. We first describe the theoretical background of our study. We then explain the research context, the scope and the methodology. This is followed by a chronological presentation of the case study, drawing particular attention to the framing contests that unfolded on both sides of the interaction as well as to the factors that allow conflicts to evolve. We end the paper with a discussion on the theoretical implications of our findings and a conclusion.

Theoretical Background

Most of the models of institutional emergence taking a neo-institutional stance (Greenwood et al., 2002; Marichal, 2009; Tolbert & Zucker, 1996) involve a mechanism of *increased objectification* (Scott, 2008). While these models are based on a consensus-building assumption, the so-called cultural-frame institutionalism perspective takes a different stance by assuming that institutional projects are the fruit of institutional entrepreneurs or activists who see in them an occasion to realize their interest (DiMaggio, 1988) or their ideology (den Hond & de Bakker, 2007). This implies that institutions can emerge from political actions or social movements that intend to challenge the status quo (Rao, 1998) and often involve a synthesizing mechanism conciliating antithetical positions (Hargrave & Van de Ven, 2006). The social movement literature suggests that challengers of the status quo can mobilize resources and people by elaborating *collective action frames* (McAdam et al., 1996b), which are 'intended to mobilize potential adherents and constituents, to garner bystander support, and to demobilize antagonists' (Snow & Benford, 1988, p. 198). From this perspective, framing is a strategic process that may lead to the production of frames which are defined as the 'outcome of negotiating shared meaning' (Gamson, 1992, p. 111). It is the 'conscious strategic efforts by groups of people to fashion shared understandings of the world and of themselves that legitimate and motivate collective action' (McAdam et al., 1996b, p. 6).

Framing can be broken down into three core tasks (Benford & Snow, 2000). The *diagnostic framing task* is the process by which problems are identified. The *prognostic framing task* is related to the identification of a solution to these problems. The *motivational framing task* provides a rationale for engaging in a movement (Benford & Snow, 2000). These basic tasks have to be complemented by other factors in order for frames to resonate, i.e. to be effective. The proffered frames

must be credible and relatively salient – i.e. central and coherent – in terms of beliefs, values, ideas, myths and everyday life of the targets of mobilization (Benford & Snow, 2000). Regarding salience, scholars have come to realize that actors must draw from a repertoire of frames (Clemens, 1993; Kaplan, 2008) or master frames (Benford & Snow, 2000; Creed et al., 2002) to elaborate legitimate accounts, otherwise their frame may not resonate. Also, actors who are the developers and carriers of collective action frames have to be perceived as credible (Kaplan, 2008). If frames do not resonate, different tactics can be used to increase the mobilization of participants in a movement (Snow, Rochford, Worden, & Benford, 1986). One of these tactics is *frame transformation*, which involves changing the content of a frame in order to promote new values but having the same finality as the original frame.

While the concept of framing has been mainly used in the social movement literature to explain strategies for acquiring resources, recruiting new members or mobilizing adherents (Benford & Snow, 2000; McAdam et al., 1996b; McCarthy & Zald, 1977), there is recent interest in understanding how social movements affect institutional change (Hardy & Maguire, 2008; Schneiberg & Lounsbury, 2008). These works are largely based on the assumption that societies are so complex and heterogeneous (Boltanski & Thévenot, 2006; Friedland & Alford, 1991) that there is wide scope for conflict to arise and for actors to engage in wars over signification. While most of the literature on social movements documents the action of movement against the state (King & Pearce, 2010), several other actors such as professionals, key suppliers, consumers and other organizations may also engage in framing activities and shape institution emergence (DiMaggio & Powell, 1983). However, if the framing activities of several actors having divergent interests collide, framing contests may ensue. Building on and extending previous work, we define a *framing contest* as the struggle over meaning that attempts to influence the action and the interpretative schemes of various audiences having a direct or an indirect interest in a certain issue.

Studies that have considered politics, social movements or framing activities to be central in the process of institutional emergence can be grouped into two categories: those developing static theoretical accounts (Rao, 2002; Sine & Lee, 2009; Weber et al., 2008) and those that are more processual in their scope (Hargrave & Van de Ven, 2006; Schneiberg & Soule, 2005). Taking the former groups of studies as a whole, they suggest, for example, that the number of social movement organizations in a given field militating for solutions to particular problems increases the likelihood of the institutionalization of these solutions. They also show that social movements provide solutions, values, norms and social structures to facilitate the work of entrepreneurs facing different challenges associated with the creation of new markets or new market opportunities. While these studies are extremely helpful in understanding which variables are crucial to the understanding of institutional emergence, they do not theorize the process by which institutions emerge over time. For example, Weber et al. (2008) show how a social movement contested the current meat and dairy industrial product system by proposing the production of grass-fed meat and dairy products, but does not theorize how the institutional emergence process evolves over time or how the proponents and opponents of a cause react when they are under attack.

Furthermore, these studies tend to focus exclusively on the activities of the proponents of changes rather than theorizing the activities of those defending the status quo. Other studies have taken up this challenge by taking political actions into account, explicitly comparing the framing and counter-framing activities of rivals engaged in struggles over meaning (Rao, 1998; Rao et al., 2003; Suddaby & Greenwood, 2005). These studies suggest that the frames receiving greater political support from influential players in a given field are likely to become dominant (Rao, 1998). Institutional emergence may also be sparked in professional settings when the number of prior defections to an old institution by peers having a good reputation has reached a critical mass and

when defectors gain from adhering to the new logic (Rao et al., 2003). While these studies empirically look at proponents and opponents of change, their comparative analysis is rather static, leaving aside the processes of framing contests over time. Furthermore, other studies have suggested process models of institutional emergence, as we will see in the next section.

Process Models of Institutional Emergence

The process models of Tolbert and Zucker (1996), Greenwood et al. (2002), Nigam and Ocasio (2010), Marichal (2009) and den Hond and de Bakker (2007) explain the institutionalization of new innovations, logics or practices. Most of these studies stem from Berger and Luckmann's (1967) work which suggests that a mechanism of 'increased objectification' (Scott, 2008) – i.e. a process that is based on an increased consensus among actors that an innovation or a practice is worthy – is involved in institutional emergence. In all these models, framing or theorization[1] (Soule, 2004; Strang & Meyer, 1993) plays a central role as it is necessary for objectification to occur. Interestingly, framing occurs relatively late in several of these process models as it depends on the technical viability of the innovation before being framed or theorized. The process model of Nigam and Ocasio (2010) is different in that it places framing not as a mechanism which intervenes late in the process of institutional emergence, but as present from the moment that an event mobilizes the attention of actors. Furthermore, in order for new logics to emerge, both representation and framing must be involved to consolidate new logics. These process models typically theorize the activities of the proponents of change and do not explicitly address the reactions of those defending the status quo. Consequently, politics and conflicts often play a secondary role (except perhaps in the paper by den Hond and de Bakker (2007) which documents the action of activists).

However, the dialectic process model of institutional innovation (Hargrave & Van de Ven, 2006) explicitly brings the political dimension into the picture. This model suggests that conflicts involving actors defending contradictory positions (thesis-antithesis) can be resolved by a *synthesis* that would satisfy the position of the stakeholders involved. Three phases are depicted. In the emergence phase, actors signal their intention to address social issues. In the developmental phase, new networks of individuals emerge and challenge the status quo in order to gain support and legitimacy. Through political behaviour, such as bargaining or negotiation, a synthesis is produced and leads to the last phase, namely, the implementation and convergence phase, where the synthesis becomes the thesis, which is going to be challenged in a new dialectic cycle. Again, in this model, a synthesis – a form of consensus – has to be reached in order for a novel institution to emerge.

Another important account, which conceives institutional emergence as a contested process and where social movements play a critical role, is the work of Schneiberg and Soule (2005). They show that institutionalization is a temporary 'settlement of political conflicts over competing models of organization' (Scheiberg & Soule, 2005, p. 152). The originality of their approach is to build a multilevel process model wherein the mixed and uncoordinated reactions of those under fire from the social movement, the government in that case, are documented at different levels. What is interesting in their theorization is that, while the national level agreed to regulate according to the social movement's demands, the lower governmental level framed issues differently and only partially implemented the new regulation. This is one rare instance where the reaction of those attacked by a social movement was theorized.

Overall, one group of studies documents the key factors that intervene in institutional emergence by looking at those that challenge current institutional arrangements (Rao, 2002; Sine & Lee, 2009; Weber et al., 2008), and by documenting the competing institutional work of rivals (Rao, 1998; Rao et al., 2003). Another group of studies is more dedicated to understanding the

process of institutional emergence by elaborating the stages that are required for a consensus to build up, thereby shaping the emergence of institutions (den Hond & de Bakker, 2007; Greenwood et al., 2002; Marichal, 2009; Nigam & Ocasio, 2010; Tolbert & Zucker, 1996). However, none of the studies from either group documents in detail how framing contests evolve over time by looking at both sides of the conflict.

While some of these studies document the phases that lead to institutional emergence and often implicitly follow the general scheme of institutionalization-deinstitutionalization-reinstitutionalization (den Hond & de Bakker, 2007; Greenwood et al., 2002; Tolbert & Zucker, 1996), none of them are explicit when it comes to theorizing the mechanisms involved in order to account for how one phase succeeds another. To understand this process in the emergence of an institution, we draw on and extend the concept of turning points (Abbott, 1997) as an endogenous mechanism explaining these shifts.

Turning Points

While external jolts (Greenwood & Hinings, 1996; Meyer, Brooks, & Goes, 1990; Tolbert & Zucker, 1996) or events (Hoffman, 1999; Nigam & Ocasio, 2010) can certainly spark a system or a field to change or to transit from one stage to another, mechanisms endogenous to field dynamics can also account for such transitions. One concept that can describe how stages succeed one another is the notion of turning points, defined by Abbott (1997, p. 101) as 'consequential shifts that redirect a process'. Turning points can be understood as the transitions between relatively stable trajectories. On a graph, turning points are recognizable by an abrupt change in the curve, preceded and followed by a period of relative stability. The concept of turning point has been typically used in stage theories in various disciplines such as economics to explain business cycles (Chaffin & Talley, 1989; Zellner, Hong, & Mia, 1991), or in political science (Lasser, 1985). However, to our knowledge, neither this concept nor anything similar has been used in institutional theories or the social movement literature to account for institutional emergence.

The concept of turning points has to be understood as a process. Indeed,

> a turning point is not an isolated event of short duration. Nor does it entail a sudden jump from one phase to another. A turning point is a process involving the alteration of…path, of a 'course correction'. A turning point requires, therefore, certain strategies and choices. (Hareven & Masnoka, 1988, p. 274)

Turning points are descriptive. As such they describe, *a posteriori*, the transitional phases that affect subsequent events, albeit without specifying the mechanisms involved. Consequently, turning points may encompass a range of mechanisms. For this reason, we use the term *turning point mechanism* as an overarching concept to account for shifts from one phase to another.

Research Context and Methodology

Research Context and Scope of the Research

Due to the context-sensitive nature of our inquiry (Patton, 2002; Yin, 2003) and our focus on process data (Yin, 2003), we used a case study approach with embedded units of analysis. Specifically, this case documents the activism of environmentalists urging the German automotive industry to reduce the emission of particulate matter by introducing the DPF technology. The final outcome that we attempt to explain is not regulative, but normative, since we investigate how the emerging demand forced the car manufacturers to react so as to include the DPF technology as default

equipment in diesel cars in Germany only. Thus, this case takes place within Germany from the mid-1980s to mid-2005, when the car manufacturers largely gave in and announced that they would equip all their diesel cars with DPF as standard.

We selected this case for two reasons. First, experts from both the German environmental movement and the automotive industry identified this case as having the potential to reflect intensive framing contest activity. As Germany is recognized as having both a powerful automotive industry and particularly active environmental NGOs, we expected to observe several instances of intense struggles for meaning. The automotive industry, both automobile manufacturers and automobile component suppliers, constitutes one of the most important industrial sectors in Germany, accounting for 866,000 employees, and 17 percent of the entire export volume (Heneric, Licht, & Sofka, 2005). The industry's joint interest group is the German Association of the Automotive Industry (VDA). Between 2001 and 2010, the average annual domestic production of cars amounted to 5.3 million. The main actors are German original equipment manufacturers (OEMs) such as Volkswagen (VW and Audi), Daimler (Mercedes-Benz and Smart), BMW and Porsche, and also foreign car manufacturers with a strong domestic manufacturing presence, such as Ford and General Motors (Opel). The environmental movement is also extremely powerful and institutionalized in Germany, having 900 organizations and about 3.5 million members (Brand, 1999; Carter, 2007). The main actors are BUND (German Association for Environment and Nature Protection), DUH (German Environmental Help), Greenpeace, NABU (Nature and Biodiversity Conservation Union) and VCD (Traffic Club Germany).

Second, although it is embedded in a wider context of emission regulations, the case is well confined to Germany. All our interview partners stressed that the heated public debate on diesel particulate matter and the DPF was an endemic German phenomenon. For example, Louis Schweitzer, the former CEO of Renault (1992–2005), said 'The discussion about the soot filter for diesel cars is typical German and not at all a topic in France' (*Die Welt*, April 10, 2005). In fact, as our case analysis will show, the debate in Germany was only indirectly linked to the emission regulations: Due to the pressure from customers, the German car manufacturers decided to install DPF systems (as standard equipment) significantly before the Euro 5 emission norm made it essential in 2009.

Technical Background

During the last 20 years, diesel-powered cars have become very popular in Germany. Compared to spark-ignition engines (running on petrol), diesel engines emit a relatively high amount of particulate matter (PM). Diesel exhaust PM is a complex mixture of different substances but its main component is carbonaceous soot. To characterize the wide distribution of the particle sizes, it is common to distinguish fine (PM_{10} with a diameter < 10 μm and $PM_{2.5}$ with a diameter < 2.5 μm) and ultrafine (with a diameter < 0.1 μm) particles. Diesel exhaust PM is a significant anthropogenic source of the overall PM concentration in the atmosphere.

As there is accumulated empirical evidence (for a review, see Pope & Dockery, 2006) that suggests a link between the ambient air concentration of PM and adverse health effects (particularly respiratory and cardiovascular effects), PM emissions are regulated in many countries. Within the EU, the corresponding regulatory environment is formed by two bodies of regulation: (1) *exhaust emission standards* which set upper limits to the amount of pollutants (such as PM) that are allowed to be discharged from a vehicle's tailpipe into the environment; and (2) *air pollution standards* which set upper limits to the concentration of pollutants in the atmosphere. Since the introduction of the first exhaust emission standards, several amendments have progressively tightened the limits

for diesel PM emissions. The standards are commonly referred to as Euro 1 (1992, diesel PM < 140 mg/km), Euro 2 (1996, diesel PM < 100 mg/km), Euro 3 (2000, diesel PM < 50 mg/km), Euro 4 (2005, diesel PM < 25 mg/km) and Euro 5 (2009, diesel PM < 5 mg/km).

In order for their diesel engines to comply with the increasingly stringent PM emission regulations, car manufacturers can basically use two approaches: (1) *internal engine* methods and (2) *exhaust after-treatment* methods (Eastwood, 2008). In the former, there are several techniques that optimize the combustion so that the engine produces less PM. Among other things, a popular direction is to burn the diesel fuel in a well-controlled mix of excess air ('lean burn') (Dunn-Rankin, Miyasato, & Pham, 2008). In the other approach, the exhaust gas can be cleansed of PM using DPF systems, which are installed between the engine and the tailpipe. While a DPF can reduce PM very effectively, it involves a number of technical challenges (thermal robustness, regeneration mechanisms and counter-pressure). For example, Daimler introduced the first diesel car with a DPF system (Mercedes-Benz 300 SD) in 1985 in the USA, but after three years ceased commercialization due to significant technical problems. These challenges, however, were tackled later and, in 2008, Eastwood (2008, p. 294) noted that 'forthcoming statutory limits are unlikely to be met by any other means [than the DPF]'.

Data Collection

We collected data from several sources. First, twelve in-depth interviews of 60 to 120 minutes were conducted with different experts and activists in order to gain a good representation of the main arguments and events which occurred in the case. Three interviews were conducted with key managers and engineers of automotive OEMs in Germany, five with environmental activists, two with members of the German government, one with a car expert and one with an expert on environmental issues. These interviews provided the basis for the case study. We started each interview with an open-ended question inviting the interviewee to tell the story of the DPF in Germany spontaneously, with emphasis on the arguments that were elaborated by the different constituents involved in the case study.

While these interviews allowed us to construct the backbone of the case study, we needed to complement this data with written documents to avoid memory bias (Eisenhardt, 1989), to identify with greater precision the dates of important events (Langley, 2009) and to triangulate our data in order to obtain an accurate case narrative (Yin, 2003). Our point of departure was a large, meticulously collected set of German newspaper articles (255 articles from 1997 to 2006) on the DPF debate, which we obtained from one of the interviewees. These articles provided an overview of the positions taken by different actors in the case (e.g. automotive OEMs, NGOs, government) and of the important events. To augment this source, we performed a series of articles searches using LexisNexis, a major news retrieval database that covers a large part of the German newspapers and business press. To reduce the risk of missing important information, we used a broad time frame (1985–2007) and searched for articles containing the word 'diesel' in combination with important keywords (including their variations and synonyms) identified from the interviews and the initial set of articles (e.g. 'soot', 'particulate matter', 'health', 'cancer', 'filter', 'eolys', 'no diesel without filter'). After the removal of duplicates, this search yielded 5,112 articles. We eliminated car reviews (because they do not reflect collective action frames) and restricted the scope to daily, weekly, and monthly periodicals with a larger circulation and of different political orientations (e.g. *Die Welt, Frankfurter Rundschau, Handelsblatt, taz, Die Zeit, Stern, Der Spiegel*). After narrowing the relevant time frame (see further details below), we arrived at a base article corpus of, in total, 2,685 articles (approximately 1.5 million words).

We also reviewed scientific publications that address the PM debate and DPF technology from a technical and epidemiological perspective (journals, conference proceedings, dissertations) to augment our understanding of the case. However, we refrained from including these documents in our data analysis, because these sources do not report collective action frames.

Data Analysis

To analyse the data, we used an open-ended approach (Strauss & Corbin, 1998). As we are investigating processes by which framing contests evolve over time and lead to institution creation, case narratives are indicated to capture the effect of time in our analysis (Langley, 1999). Consequently, we began by building a case narrative out of our interviews, which were transcribed by a professional typist. To this end, we arranged all available articles chronologically to obtain a reliable timeline of the events that constitute the case narrative. This allowed us to evaluate whether we had a sufficiently interesting story to tell (Siggelkow, 2007) and to identify which aspects were more promising for a theoretical contribution. The timeline suggested that the case takes place between 1985 and mid-2005, i.e. from the moment that public attention turned to PM emissions to the moment at which the car manufacturers gave in and agreed to equip all their diesel cars with DPF systems as standard. Next, we compared the timeline with the case narrative obtained from our interviews and adjusted it according to the written documents. This decision is based on the assumption that written documents are more reliable given that interviewees often have difficulties in recalling dates. Thus, this approach avoids chronological biases (Langley, 2009) and allows for the triangulation of our data, thereby further substantiating our case study (Eisenhardt, 1989).

Based on the case narrative, we conducted a detailed manual frame analysis (Goffman, 1974) which implies the systematic study of how actors deploy meaning to affect interpretation (Kaplan, 2008). In order to increase the likelihood of capturing interesting phenomena, we coded our data along several dimensions, as shown in Table 1. To handle the large article corpus (2,685 articles), we started by coding a sample of 30 articles per month (if available) with each sample equally distributed across the entirety of the month. If a saturation point was reached after coding the 30 articles (Eisenhardt, 1989) – that is, when we determined that the same arguments were repeated and further reading would not provide new information – we stopped, otherwise we continued coding additional articles until we attained saturation. In total, the frame analysis covered 577 articles.

Specifically, we focused on identifying excerpts that constitute collective action frames, that is, schemata of interpretation that are deliberately developed and carried out by proponents, opponents and their audience to 'fashion shared understandings of the world and of themselves that legitimate and motivate collective action' (McAdam et al., 1996b, p. 6). We used the typology of Benford and Snow (2000) to classify our material in terms of the tasks the frames were accomplishing in the case study. This typology has a long tradition (e.g. Snow et al., 1986), is well-established (Davis et al., 2005; McAdam et al., 1996b) and is extensively used in the organization theory literature (e.g. Kaplan, 2008; Weber et al., 2008). Accordingly, citations that identified a problem were coded as *diagnostic* frames. Excerpts that proposed a solution were coded as *prognostic* frames, and citations that invoked any kind of incentives to shape or affect the behaviour of actors were coded as *motivational* frames. In addition, for each frame we coded whether the underlying intention was in favour ('pro') or against ('con') the DPF, the articulator ('who'), the source of the excerpts (i.e. from where the document was taken) and the date of the document from which it was taken,in order to retrieve the material easily and to follow the chronology of events. To deal with the large number of different excerpts, we followed a technique similar to that developed by

Table 1. Examples of the coding table.

Frame task	Aggregate theme	Frame (second-order themes)	First-order themes	Polarity	Excerpts	Who?	Date	Source
Diagnostic	Public health issues	Diesel PM is likely to be harmful for human health	Diesel particulate matter can cause cancer	Pro	Soot particles from diesel exhaust are becoming smaller and more dangerous. The theory stating that these particulates are harmful to health when inhaled, and in the worst case can cause cancer, has long been disputed among scientists. Now, this theory is proven.	Scientists	1997-10-11	*Der Spiegel* (weekly)
			Diesel is more likely to cause cancer	Pro	Today and in the foreseeable future exhaust from diesel engines are several times more prone to cause cancer than exhaust from gasoline engines.	Scientists	1999-01-21	*Stern* (weekly)
		No scientific evidence that diesel PM is noxious for human	Negative effect of the diesel exhaust on human health cannot be proven	Con	Recent research by the US Health Effects Institute show that exhaust from modern diesel engines cannot be related to negative health effects on humans.	German car industry (President of VDA)	1999-08-22	*Welt am Sonntag* (weekly)
			Negative effect of the diesel exhaust on human health cannot be proven	Con	Dr Norbert Metz, BMW AG…pointed out that it has not been scientifically proven that diesel particulate matters have an effect on health.	German car industry (Norbert Metz from BMW)	2000-04-18	ADAC Flughafenge-spräche

Table 1. (Continued)

Frame task	Aggregate theme	Frame (second-order themes)	First-order themes	Polarity	Excerpts	Who?	Date	Source
Prognostic	Techno-logical risks & benefits	DPF is a solution to reduce diesel PM	Peugeot's DPF technology works	Pro	The only remaining problem with modern diesels is the particulates. We are proud to announce that we have developed the world's first efficient soot particulate filter that comes…with the Peugeot 607 HDI.	PSA Peugeot / ADAC (Jean-Martin Folz, CEO of PSA)	2000-01-13	*Die Zeit* (weekly)
			Peugeot's DPF technology works	Pro	It has been a while since the filter for diesel engines in the Peugeot 607 proved to be successful. The tests show that even after 80 000 kilometres, the filter was still working as well as a new one. For a little extra manufacturing cost, the filter should be able to eliminate 99.9% of fine particulates.	Federal Environ-ment Agency & ADAC	2001-09-30	*Die Welt* (daily)
Prognostic	Techno-logical risks & benefits	DPF is not a good solution to reduce diesel PM	Discredit DPF technology	Con	By using diesel particulate filters, we resolve one problem to create another one…as it is increasing consumption and CO_2 emissions.	German car industry (CEO of Mercedes)	2001-11-19	*Der Spiegel* (weekly)
			Discredit Peugeot's DPF technology	Con	This is just a marketing campaign of the French.	German car industry	2003-02-26	*Süddeutsche Zeitung* (daily)

(Continued)

Table 1. (Continued)

Frame task	Aggregate theme	Frame (second-order themes)	First-order themes	Polarity	Excerpts	Who?	Date	Source
Motivational	Economic risks and benefits	Devaluation of the diesel cars without filter	Cars without DPF will lose value	Pro	Customers who buy cars with an older technology will be disappointed as the loss of value for diesel cars without particulate filters will be high in the next few years.	Environmental Movement	2004-01-26	DPA (press agency)
			Cars without DPF will lose value	Pro	New cars without particles filters will dramatically lose their reselling value.	DUH (Jürgen Resch)	2004-07-15	*Die Welt* (daily)
		The value of diesel cars will not change without filter	Counter-argument to 'Cars without DFP will lose value'	Con	The rumours imagining that cars without soot filters will lose €1000 per vehicle do not match the facts.	German car industry	2005-05-17	*Börsen-Zeitung* (daily)

Gioia (e.g. Corley & Gioia, 2004), which seeks to identify the frames and the main themes animating the debates about the DPF. Each excerpt was categorized along an increasing level of abstraction from first-order theme, to second-order theme, and finally to the aggregate level (see Table 1). The clustering logic was to pool together excerpts according to their similarity, i.e. high similarity within a category, high dissimilarity between categories. This method facilitated the identification of collective action frames that correspond to the second-order themes (e.g. 'devaluation of diesel car without diesel filter'). We identified six aggregated themes that correspond to the pooling of frames having related content. For example, the collective action frame 'devaluation of diesel car without diesel filter' was classified under the aggregate theme 'economic risks and benefits' because it talks about the economic risks customers incur if they choose to buy a diesel car with or without DPF. The aggregate themes identified were: (1) public health issues; (2) risks and benefits of the technology; (3) behaviour (in)appropriateness; (4) cohesion/fragmentation; (5) regulatory intervention issues; and (6) economic risks and benefits. All themes emerged completely from the data (Agar, 1980). The material was coded iteratively by reading it several times and by adjusting and adding new codes as they appeared in the analysis. In practice, we systematically cut every quote that we found in our material and pasted it into an MS Excel spreadsheet (because the pivot table function allowed us to build synthetic tables quickly). Specifically, to synthesize the data, we organized it into a matrix display (Langley, 1999; Miles & Huberman, 1994) with two columns (i.e. in favour or against the DPF) and along the identified timeline. This helped us to identify which framing contests were taking place when and around which theme. A selected sample of these frames is presented in Tables 2, 3, 4 and 5. They provide several examples of how the matrix display was used and how frames were coded. The material was coded by a native speaker in our author team. Besides the coding done by ourselves, a sample of 10% of our excerpts was coded by a doctoral student who is a native speaker of German. The interrater reliability was found to be good as indicated by a Cohen's kappa value of .79.

Our analysis showed significant changes in the themes around which framing contests were taking place and in the activities of the key actors. Specifically, we observed four major phases split by important changes which occur in the framing activities of the social movement and the automotive industry. We will analyse and explain these phases and the underlying mechanisms in detail in the next sections.

Finally, in order to augment our understanding of the dynamics of the framing contests and the turning points, we performed a simple dictionary-based text analysis of our article corpus. Following Cho and Hambrick (2006), we constructed several dictionaries of words (generated from the manual frame analysis, see Appendix) reflecting major themes around which the framing contests revolved (e.g. 'health', 'tax incentives', 'value of the car'). After parsing the articles that were identified to deal with the DPF debate, we programmed a simple script that binary coded each article for each theme. For example an article was coded '1' for the theme 'health', if a word of the corresponding dictionary appeared in the article, and '0' otherwise. Then, the obtained article-level data were aggregated (summation) to monthly time series. The result, Figure 2, will be presented in the analysis section.

Case Study: The Diesel Particulate Filter in Germany

Phase 1: Initial Contests and Local Objectification (January 1985 – February 2002)

Diagnostic frames and counter-frames. The first scientific publications on the health effects of airborne particulate matter (PM) appeared in the 1980s. Several studies suggested a positive link between exposure to PM air pollution and daily mortality rates caused by lung cancer and

Table 2. Frames and counter-frames: Phase 1 (January 1985 – February 2002).

Date	Aggregate Themes	Framing tasks	Proponents' frames	Opponents' counter-frames
01/85 – 10/99	Public health issues	Diagnostic	Diesel PM causes health problems (cancer, cardiovascular diseases, inflammatory processes, etc.). Diesel PM enters the bloodstream and brain.	Diesel PM has no effect on health. Lack of evidence.
	Risks and benefits of the technology	Prognostic	DPFs would be a response to lower PM emissions.	Technological infeasibility. Internal engine methods are a better alternative technology DPFs are too expensive to produce.
11/99	Risks and benefits of the technology	Prognostic	Diesel cars of German manufacturers are polluting. Peugeot's cars are clean because they are equipped with a DPF DPFs are a proven solution to lower diesel PM emissions.	Due to additive, Peugeot's technology is even more polluting. Peugeot uses the DPF to compensate its ineffective Euro 3 diesel engines. French technology is ineffective. Internal engine methods are a better alternative technology.
03/00	Public health issues	Diagnostic	Diesel PM causes health problems (carcinogenic, leads to inflammatory processes, etc.). Diesel PM enters the bloodstream and brain.	Lack of evidence.
10/00 – 08/01	Risks and benefits of the technology	Prognostic/ Diagnostic	ADAC study shows that DPFs are effective in limiting diesel soot particulate emissions.	
10/01 – 11/01	Economic risks and benefits	Motivational	DPFs do not increase fuel consumption.	The discussion is one-sided on diesel PM and neglects trade-offs such as increasing fuel consumption.
02/02	Public health issues	Diagnostic	Diesel particulates cause health problems (cancer, cardiovascular diseases, inflammatory processes, etc.). Diesel PM enters the bloodstream and brain.	Diesel soot has no effect on health.

Table 3. Frames and counter-frames: Phase 2 (March 2002 – August 2003).

Date	Aggregate themes	Framing tasks	Proponents' frames	Opponents' counter-frames
09/02	Risks and benefits of the technology	Prognostic	DPF is the best available technology. Car manufacturers could instantly equip all their cars with DPFs.	Internal engine methods are a better alternative technology.
09/02 – 10/02	Regulatory Intervention	Motivational	Tax incentives should be introduced. Current emission standards are inappropriate.	
12/02	Risks and benefits of the technology	Prognostic	Filter is effective, even children can show it (the experiment).	
	Public health issues	Diagnostic	Increases the number of deaths. Poses high risks for children.	
	Economic risks and benefits	Motivational	Filter decreases fuel consumption.	Filter increases fuel consumption.
	Behaviour (in) appropriateness	Motivational	It is irresponsible to not take into account evidence that the DPF is effective.	The experiment was inappropriate because it involved children.
02/03	Economic risks and benefits Cohesion/ fragmentation Behaviour (in) appropriateness	Prognostic Motivational Motivational	Movement is ready to support car manufacturers which would use filters. Symbolically penalizing those who do not use filters.	Consumers have no willingness to pay for environment-friendly products. Ford Germany asks for red card to preserve solidarity. German industry reacts by sanctioning players who are ready to collaborate with the movement.
03/03	Risks and benefits of the technology	Prognostic	The DPF is an effective technology.	Alternative technology is better.
07/03	Regulatory intervention issues	Motivational	Taxes on diesel cars or taxes on diesel fuel should be increased Law should coerce introduction of DPFs.	Taxes on diesel cars or taxes on diesel fuel will not be increased.
	Public health issues	Diagnostic	Study published by the government shows that 14 000 people die before their time in Germany due to diesel fine particulates.	

(Continued)

Table 3. (Continued)

Date	Aggregate themes	Framing tasks	Proponents' frames	Opponents' counter-frames
08/03	Behaviour (in) appropriateness	Motivational		Saying that 14 000 Germans are dying every year due to diesel soot is pure panic-mongering.
	Public health issues	Prognostic	DPFs would increase the life expectation in Germany.	
	Public health issues	Diagnostic	Diesel PM causes important health problems.	

Table 4. Frames and counter-frames: Phase 3 (September 2003 – August 2004).

Date	Aggregate themes	Framing tasks	Proponents' frames	Opponents' counter-frames
09/03	Economic risks and benefits	Motivational		We [industry] will do what the market asks
01/04	Economic risks and benefits	Motivational	Without a particulate filter cars will depreciate faster.	
02/04	Public health issues	Diagnostic	8500 people die before their time in Germany.	
03/04	Public health issues	Diagnostic	Science has proven that soot particulates cause health problems.	
	Risks and benefits of the technology	Prognostic	DPF technology is effective.	
04/04	Public health issues	Diagnostic	Diesel PM causes important health problems.	
06/04	Regulatory intervention issues	Motivational	Tax incentives favouring the introduction of the DPF might resolve the problem of soot particulate.	Tax incentives might kill the diesel car industry in Germany. Tax incentives might kill alternative technologies.
07/04	Economic risks and benefits	Motivational	Cars without filter will drop dramatically in value.	

cardiopulmonary diseases (Dockery & Pope, 1994; Pope et al., 1995; Schwartz, 1991). In 1989, the International Agency for Research on Cancer (part of the World Health Organization) rated diesel engine exhaust gas as 'probably carcinogenic to humans' (International Agency for Research on Cancer, 1989, p. 42). At that time, some NGOs in Germany started to turn their attention to diesel cars and identified their PM emissions as a major public health problem. In 1997, a commentary article in *Science* (Kaiser, 1997), which synthesized findings from extant studies, drew initial attention from German newspapers and weeklies on this topic: 'the strongest association between any pollutant and death rates was with fine particles' (*Der Spiegel*, November 10, 1997).

Table 5. Frames and counter-frames: Phase 4 (September 2004 – August 2005).

Date	Aggregate themes	Framing tasks	Proponents' frames	Opponents' counter-frames
03/05	Public health issues	Diagnostic	Diesel particulates cause important health problems such lung cancer and heart problems. 65,000 people die before their time due to air pollution caused by fine particulate matter.	Diesel particulates are only a small part of the fine particulate matter pollution problem.
	Regulatory intervention issues	Motivational	Ban cars without filter in inner cities.	
	Cohesion/ Excerptation	Motivational	To protect the German automotive OEM, the German government delayed the introduction of tight thresholds.	
	Risks and benefits of the technology	Prognostic	Filters are effective.	
	Regulatory intervention issues	Motivational		The tax debate has negative effects on the buying behaviour of the consumers. Regulation would have negative effects on German car industry.
05/05	Economic risks and benefits	Motivational	Cars without filters will lose dramatically in value.	A loss of €1000 in resale price is exaggerated.
	Public health issues	Diagnostic		Diesel particulates are only a small part of the fine particulate matter pollution problem.
	Regulatory intervention issues	Motivational	The filter technology will only penetrate the market if there are tax incentives.	Regulation would have negative effects on German car industry.
06/05	Behaviour (in) appropriateness			Mr Y [member of the social movement] is a trouble-maker for the car industry.

The NGOs' concerns grew as the propagation of diesel direct injection technologies (e.g. common rail) during the 1990s led to an increase in the emission of ultrafine particles that were suspected of being the most dangerous class of particle (because they can pass through the human lung, enter the bloodstream and accumulate in organs):

> With the injection technologies of diesel fuel into the combustion chamber, particulate matters became smaller and smaller. We have micro-particulates of nano size which can enter not only the lungs and its capillaries, but also could enter the bloodstream and end up in the brain. (Environmental activist, interview, 2010)

For these reasons and since the PM concentration in many German inner city areas regularly exceeded the limits set forth in the early air pollution standards, some environmental NGOs such as Greenpeace requested the automotive industry and politicians to develop solutions for the diesel PM issue. The car manufacturers reacted by calling into question the validity of the cited studies: 'Latest research from the US-Health Effects Institutes shows that there are no measurable effects of the exhaust of modern diesel engines on health' (managing director of the German Automotive Industry Association, August 22, 1999).

Moreover, it was argued that diesel cars would contribute only to a small extent to the total anthropogenic PM emissions. Given that exhaust after-treatment systems were already available for heavy diesel trucks, members of the environmental movement suggested R&D into DPF technologies (e.g. Greenpeace, 1993). In response, the car manufacturers stressed the technological challenges, costs, and trade-offs associated with DPFs: 'The industry was saying that diesel particulate filters are not necessary, it's not possible, it costs too much money' (Government representative, interview, 2010).

Prognostic frames. Against this background, the French automotive OEM, PSA Peugeot-Citroën, sensed a market opportunity in Germany and presented a diesel car with a DPF (Peugeot 607 HDi FAP) at the Frankfurt Motor Show in September 1999. Overall, the car fulfilled only the current Euro 3 norm, but emitted very little PM due to a filter system ('FAP') developed by Faurecia, a French supplier in which PSA held a majority stake. The car model was launched on the German market in early 2001 where it was unique in that it was the only diesel car available with DPF. Interestingly, PSA targeted the German market exclusively with their DPF system (officially, the DPF system was also launched in France, but it hardly sold). The launch was accompanied by a marketing campaign including three major TV commercials that compared the 'clean' Peugeot with the 'pollutant' German diesel cars. The marketing campaign increased public awareness of the diesel soot issue and highlighted that DPFs are a technologically feasible solution.

The German car manufacturers dismissed PSA's filter technology as ineffective because it required a chemical additive which would be more pollutant and toxic than the diesel exhaust itself and because the filter needed to be serviced every 80,000 kilometres. Besides, they continued to maintain that there was no solid evidence supporting the adverse health effects of diesel PM:

> There is a lack of scientific evidence for the interaction of particulates and its effects on human health. I doubt that results from rat tests are informative for human health. Epidemiologic studies are lacking and need to be conducted. (Manager from BMW, April 18, 2000)

Due to the dispute, environmental NGOs asked ADAC, Germany's largest automobile club, to assess PSA's DPF technology. In the first half of 2001, ADAC engineers performed a long-term durability test of a DFP-equipped Peugeot and compared its emissions to those of a similar-sized German car. The results, published in August 2001, indicated that the DPF system functions reliably and that it reduces PM emissions to almost zero (10,000 times less PM than the German car model).

> A long-term emission durability test of a particulate filter-equipped Peugeot 607 HDi passenger car has been completed by the Allgemeine Deutsche Automobilclub [ADAC, the German Automobile Club] and the Umweltbundesamt [UBA, the German Federal Environmental Agency]. The particulate filter was found to function reliably over the 80,000 km long test. Emission tests conducted after the 80,000 km showed that the particulate filter removed over 99.9% of the fine diesel particles. The UBA said, the

> Peugeot 607 HDi tested emitted on average 10,000 times fewer particles than a comparable vehicle without particle filter. (Dieselnet, September 2001)

The German car manufacturers did not deny these results but criticized the discussion as naive and one-sided on the PM issue: 'The filter might solve some problems but increases new ones, such as [fuel] consumption…' (CEO of Mercedes car group in *Der Spiegel*, November 19, 2001)

They contended that only internal engine methods would be able to reduce PM emissions without undesirable side effects. They pointed out their own R&D efforts on these methods and stressed that most of their new diesel car models already attained the stricter Euro 4 norm, placing them ahead of the Peugeot cars in terms of overall emissions. Table 2 summarizes the main frames and counter-frames that were mobilized by proponents and opponents of the DPF during the first phase.

Phase analysis. The most frequently used frames during this initial period can be grouped under two core framing tasks: diagnostic (problem) and prognostic (solution). The case started with the activism of a few environmental NGOs which – based on the results of several scientific studies – identified diesel car PM emissions as a major public health problem. This set of diagnostic frames, which revolved around public health, was directly counter-framed by the car manufacturer through denial (lack of sufficient scientific evidence for adverse health effect) and relativization (diesel cars account for just a small portion of the total anthropogenic PM emissions). Then, based on the availability of DPFs for trucks, the environmental NGOs elaborated a prognostic frame (DPF as a solution to the identified problem) that was directly counter-framed by the car manufacturers by arguing that DPFs for cars face too many technical challenges, are too costly, and overall not necessary to attain the forthcoming Euro 4 norm (due to become effective in January 2005). The car manufacturers invested in internal engine methods as part of their strategy to comply with Euro 4 (and even higher) and they sought to protect these investments from environmental disturbances. Thus, this first step towards institutional emergence is characterized by completely opposing frames concerning the diagnosis of the status quo (recognition and denial of public health issues) and concerning the technical feasibility and reasonableness of a solution to the potential problem. These initial contests constitute the necessary conditions for a conflict to erupt. Without a problem and a solution, it is difficult to engage on an issue with the expectation of reaching some form of resolution.

In this situation, the prognostic collective action frames considering the filter as a solution gained significant tangible support to deconstruct the arguments of the automotive industry. Peugeot's DPF technology provided evidence to the first NGOs involved in the future social movement that the filter was a technically feasible solution and thwarted the technological infeasibility arguments of the German car manufacturers. As the German car manufacturers counter-framed this new development by discrediting PSA's DPF technology (generally ineffective, not reliable, inconvenient maintenance, overall more polluting), the automobile club ADAC – generally considered as an independent organization with credible car expertise – ran rigorous tests and 'proved' that the DPF was effective and reliable. This was perceived and acknowledged by the NGOs and the media that the DPF was a tangible solution. Germany's largest weekly news magazine commented: 'The new arguments brought forward by the German car manufacturers are losing their credibility in the light of these [ADAC's] results' (*Der Spiegel*, September 11, 2001).

The establishment of the effectiveness of the filter being consensually perceived as a tangible *fact* by potential adherents of the nascent social movement is a fundamental element for explaining why the social movement was able to attract and mobilize a large number of followers in the next phase. In their first letter to the German car manufacturers, the newly-founded environmental

coalition requested: 'Equip diesel cars with soot filters! The technology is available!' (November 26, 2002).

As will be explained in a later section, we refer to this increased evidence-based consensus among the first NGOs involved in the movement as local objectification. It is local because this objectification (Berger & Luckmann, 1967; Tolbert & Zucker, 1996) has the capacity to affect potential adherents to the movement and is unlikely to mobilize defenders of the status quo. Without such local objectification, the social movement's mobilization might not have taken place.

Phase 2: Legitimacy Contests and Movement Legitimacy (March 2002 – August 2003)

Mobilization. In March 2002, in the face of the German car manufacturers' persistent resistance, some members of the initial environmental movement met with the German car manufacturers to state that the NGOs would 'go to war' if they would not introduce DPFs. In September 2002, the failure of these negotiations pushed several NGOs (Greenpeace, DUH) to campaign more intensively to attract public attention on the PM issue; but the position of the car manufacturers did not change:

> The German automotive industry considers internal engine solutions to be a smarter approach than after-treatment, because it avoids the production of particles…The utilization of filter systems leads – according to the current state of technology – to higher fuel consumption, higher costs and requires special maintenance in order to clean the system from residues. (German Association of the Automotive Industry, November 25, 2002)

In parallel and particularly during the national election race (Bundestag election in September 2002), the environmental movement and PSA were lobbying politicians to support tax incentives and to stand up for stricter European exhaust emission standards. Then, in November 2002, a coalition named 'Kein Diesel ohne Filter' ('No diesel without filter') was officially founded under the leadership of DUH and joined by the major German environmental NGOs (BUND, DNR, Greenpeace, NABU and VCD). The coalition grew rapidly and after a few months also included the World Health Organization, the German Child Protection Association, ADAC, as well as 97 smaller NGOs. Creating a coalition was considered to be one of the few tactics that would make the German car industry move. A government representative stated, 'Only a coalition has the strength to go against the power of the car industry.' The aim of this coalition was to 'promote the rapid and widespread installation of particulate filters in order to fight against diseases induced by diesel soot' (internal document). Dieselnet reported:

> A coalition of German environmental organizations has started a 'No Diesel Without Filter' campaign, calling on auto manufacturers to voluntarily fit diesel particulate filters (DPF) on all passenger cars sold in Germany. The group also called on the government to introduce tax incentives stimulating market introduction of DPF equipped cars. (Dieselnet, December 2002)

The fact that the French competitor PSA could introduce the technology was also an argument brought forward by the pro-DPF coalition to attack the car manufacturers: 'If the French manufacturers did it, the German manufacturers can also do it.' In December 2002, in order to support their claim that diesel PM is dangerous to human health, the coalition started their campaign with a press conference where they conducted an experiment with two German diesel cars – one

equipped with a DPF (provided by Faurecia), the other without. The following quote describes the experiment which was performed by a three-year-old child:

> So we could show that if you monitor the emissions of a normal diesel car with a normal paper tissue, it is still white after half a minute. This gives the impression that the car is clean. Then, the child used a special white particulate filter tissue. It became black in seconds. It was really impressive. With this experiment, we could show that even a paper tissue cannot block extremely small particulates and that we need a special tissue with extremely small structure to block them. (Environmental Activist, interview, 2010)

Buffering. After this public demonstration, the pro-DPF coalition approached various German car manufacturers to offer their support in exchange for the introduction of the DPF in their fleets by mid-2003. Ford Germany was the only one inclined to talk to the coalition and even negotiated with PSA/Faurecia with regard to the supply of DPF modules. In order to motivate Ford Germany, the coalition gave a red card (by analogy, being sent off the field in soccer) to each German car manufacturer except for Ford Germany, which received a yellow card (analogous to receiving a warning in soccer). Just after it received a yellow card, one of the top managers of Ford Germany called a member of the coalition and asked to be given a red card as well because all the CEOs of the other German car manufacturers were angry that Ford Germany had agreed to negotiate with the coalition. They threatened Ford Germany with isolation from the German Car Manufacturers Association:

> Within two hours, I got a phone call from the office of the director of Ford Germany. The assistant of the CEO told me: 'Mr Y, you can't imagine what is happening. Every five minutes we get phone calls from the other CEOs of German car manufacturers. They are telling us that the alliance at the German Association of the Automotive Industry…is broken [by Ford Germany]. We have to ask you to give us a red card like the others [car manufacturers] because we have to cancel our order with PSA for particulate filters. I know it's absurd to ask PSA to reconstruct that engine without particulate filter, although this engine was only available in a series production with particulate filter, but [Ford Germany] doesn't want to be leader with the filter, we want in the years to come to make motors without particulate filters. Otherwise the alliance with all the others [car manufacturers] is endangered.' (Involved Environmental Activist, interview, 2010)

There was strong pressure inside the automotive industry to stay united with the majority of car manufacturers who argued that fair competition means setting and attaining emission standards and not dictating specific technologies. For example, as the proponents made attempts to mobilize DPF suppliers (Faurecia and others) who had an obvious interest in the success of the pro-DPF campaign, the German car manufacturers threatened to terminate or curtail their supply contracts with these suppliers (later, it turned out that certain DPF suppliers even supported the pro-DPF coalition with funds). Likewise, in August 2003, another German car manufacturer hinted that it could install DPFs in some of its car models, but it hesitated to be the first mover. In parallel, the Federal Environment Agency (UBA), Germany's central federal authority on environmental matters, published an epidemiological study which estimated that 14,000 people were dying each year in Germany due to the emission of traffic-related PM. Various seminars were held by lung specialists with the aim of informing the public about the consequences of diesel PM. Table 3 summarizes the main frames and counter-frames that were mobilized during this episode.

Phase analysis. The point of departure of this second phase was the local objectification (i.e. the filter perceived as a viable solution) of the proponent's prognostic and diagnostic frames, which

constituted a powerful means for mobilizing homogenous actors. Indeed, using the mobilization capacity of the locally objectified frames, the proponents were able to form a coalition around organizations and actors whose values resonated with the proffered frames. Their joint goal was to promote the DPF as a technological de facto standard. Because the coalition covered a broad range of NGOs having different goals (e.g. advocating for children, health and health care, traffic issues, environmental causes) with several of them being perceived as more reformative than radical (den Hond & de Bakker, 2007), this social movement gained significant legitimacy: 'This [the coalition] is almost unbelievable; it is unprecedented that Greenpeace, scientists and ADAC are sitting together in the same boat' (an epidemiologist in *Die Zeit*, December 5, 2002). This movement legitimacy brings about the turning point of this stage and enables the next phase in the process of institutional emergence.

In this phase, however, the movement was still attempting to mobilize. Members of the social movement even used a divide-and-conquer strategy in order to deinstitutionalize, i.e. recruit or 'proselytize', members of the automotive industry. The car manufacturers faced difficulties in maintaining their cohesion because Ford Germany and the DPF suppliers were ready to cooperate with the environmental movement. These attempts at expansion and deinstitutionalization forced the automotive industry to buffer such external aggression by disciplining its members, which took the form of threatening to terminate or curtail their relationship with some suppliers and Ford Germany. This buffering tactic was coupled with efforts to delegitimize the movement. Indeed, following the experiment which involved the contribution of a three-year-old child, the car manufacturers attempted to delegitimize the movement by arguing that the experiment was abusive and unjustifiably emotional because it involved a little child. They also accused the environmental movement of inappropriate behaviour when the movement brought into the frame that diesel PM kills 14,000 people per year. They dismissed this frame as 'panic-mongering'. These attacks suggest that the defenders of the status quo, i.e. the automotive industry, were seeking to erode the integrity and legitimacy of the challengers of the status quo.

Phase 3: Motivational Contests and Local Objectification (September 2003 – August 2004)

In September 2003, on the occasion of the Frankfurt Motor Show, the German car manufacturers reacted and announced that they would begin offering DPFs for all cars until mid-2004. They stated: 'We will do what the market asks.' However, while the DPF would come as standard equipment in cars with larger diesel engines, their plan was to offer the DPF only as an optional extra (at an extra charge of €300 to €1,000) for cars with small engines. They argued that DPFs would have an unfavourable benefits-cost trade-off for small engines. As the majority of customers were still largely indifferent, the response of the car manufacturers meant that most of the German diesel cars would still be sold without a DPF. To affect consumer behaviour, the proponents had been pressing politicians for the introduction of tax schemes since the national election race in autumn 2002. After the denial of the car industry, the proponents intensified these lobbying efforts.

Value of the car. In October 2003, the Federal Environmental Agency (which supported the pro-DPF coalition) asked EurotaxSchwacke, an independent market research institute well-known for its expertise in forecasting market values of used cars, to conduct a study on how the introduction of tax incentives would affect the probable resale value of diesel cars. The study projected that, after three years, diesel cars without a DFP would have a 5 percent lower resale value than those with a DPF. The conclusion was that, given the uncertainty of whether or not tax incentives would

be introduced in the near future, customers would be better off if they proactively bought diesel cars with pre-installed DPF systems: 'Customers who buy a new car now but – because of the surcharge – decide to pass up a particulate filter, risk experiencing significant financial losses in the future' (Manager from EurotaxSchwacke, quoted in several periodicals, October 26, 2003). Furthermore, EurotaxSchwacke laid out implications for leasing contracts: 'In cases of leasing contracts that include a fixed residual value, customers will have to pay more for the car than it is actually worth' (Manager from EurotaxSchwacke, quoted in several periodicals, October 26, 2003).

The environmental movement disseminated the results of the EurotaxSchwacke study and, in parallel, continued to push for tax incentives to be implemented.

Tax incentives. At the beginning of 2004, the pro-DPF coalition and the car manufacturers were both struggling intensively to persuade the federal government to support them. The proponents organized various hearings where NGOs, WHO, physicians and children's advocacy associations presented public health arguments and militated in favour of tax incentives. They reiterated the results of an epidemiological study (commissioned by the Federal Environment Agency (UBA), Germany's central federal authority on environmental matters), released in July 2003, which estimated that 14,000 people were dying each year in Germany due to the emission of traffic-related PM. The automotive industry was also active in terms of lobbying. As one interviewee put it: 'They complained at the Minister level, at the parliament level, they did everything they could do…It was a big fight' (interview, 2010).

In March 2004, only three hours after the government coalition (green party and social democrats) considered that tax incentives to promote DPFs could be an option, the CEO of Volkswagen wrote a private letter to the government stating: 'If you force the [car] manufacturers to use this technology [DPF], you will kill the German diesel industry' (*Automobilwoche*, April 25, 2005).

To signal they were not completely against the DPF, German car manufacturers announced in summer 2004 that diesel engine cars having a capacity above 1.6 litres would be equipped with the filter. However, cars with lower capacity would still not be equipped due to technical challenges. In a rebuttal of the latter argument, the environmental coalition asked suppliers to install a soot particulate filter on a microcar. In July 2004, they were able to present a prototype of a DPF system inside a microcar (Smart ForTwo cdi with a 0.8 litre engine) and claimed that the filter could be manufactured economically. The summary of this phase is shown in Table 4.

Phase analysis. The car manufacturers' actions remained focused on complying with emission norms and on addressing the demands of the customers. They had stated 'We will do what the market wants.' However, despite the intensive framing of the challengers of the status quo, the majority of customers were still largely indifferent. None of the previous frames had resonated sufficiently with the car manufacturers or with the majority of customers. For this reason, the DPF proponents transformed their diagnostic frames (Snow et al., 1986) into a motivational frame to fit the values of the customers, namely, to establish frames that connect the purchase of cars without DPF with individual costs, risks, or losses on the part of the car owner. In other words, they transformed their public health frames into an economic incentive frame.

At the same time, the coalition disseminated the frame that 'many people die in Germany because of diesel soot particulates', which was derived from a credible study commissioned by the Federal Environmental Agency. This frame attracted government attention and triggered a discussion on how to motivate customers to buy cars with DPF (ranging from banning diesel cars from

inner cities to tax incentives). In reaction, members of the automotive industry counter-framed the motivational frames of the movement by reminding the government that such legislation would seriously hurt the German car industry, threaten many jobs, and after all be inconsistent with European law. While the *regulatory intervention* frame had already been voiced earlier by the DPF proponents, what is specific to this phase is that this frame was powerfully counter-framed by threatening the government that tax incentives could 'kill' the diesel car technology in Germany. These framing and counter-framing struggles gave rise to motivational contests where the aim was to mobilize critical actors with reference to whether to maintain the status quo or to create incentives for customers to buy diesel cars with DPF.

In order to move forward, the social movement could not merely rely on their collective action frames. Again, the frames had to become locally objectified, meaning that people had to see evidence that motivational frames are tangibles, that they have material consequences. The process leading to local objectification began by asking EurotaxSchwacke to conduct a study on the future resale value of diesel cars without filter. This study highlighted significant losses for cars without DPF.

However, the report was not sufficient to generate local objectification. Indeed, in order for local objectification to reach a turning point where customers began asking for the DPF, the threat of a tax incentive implemented played a crucial role. Although it was not yet clear which direction the legislation would take, the permanent discussion created a significant amount of uncertainty among customers. So, the combination of the 'value of the car' frame with the uncertainty revolving around tax incentives created the turning point. Leasing firms were the first movers:

> We commissioned a study and it concluded that the value of a car without a filter would be about 500 to 2,000 Euros lower [than a car with a filter] after five years. Our conclusion alarmed leasing companies because they rely on the value of used cars to resell their cars…So, leasing companies made a calculation on the value of cars after the leasing period. If the value is going down, of course, they have a big loss of money. If you buy 100,000 vehicles and each vehicle loses 2,000 Euros above average, you lose a lot of money. The study was conducted by a company which evaluates the value of used cars. (Representative of the Federal Environmental Agency, interview, 2010)

Phase 4: The Emergence of a Standard (September 2004 – August 2005)

The demand for diesel cars equipped with DPF increased during late 2004 and early 2005:

> The German manufacturers have done their homework by equipping their vehicle line-ups with particulate filters more quickly than many had expected…Almost 100,000 diesel cars were fitted with particulate filters in the first four months of the year. German brands accounted for more than 80 per cent of these vehicles, meaning that 30 per cent of the domestically produced diesel cars in Germany are now equipped with a particulate filter. (German Association of the Automotive Industry, June 3, 2005)

In April 2005, EurotaxSchwacke updated their initial study on the depreciation of cars without filters and reiterated their conclusions. Several newspapers headlined this updated study: 'Diesel cars lose drastically in value' (*Automobilwoche*, April 11, 2005), 'Loss of value without filter' (*Stuttgarter Nachrichten*, April 11, 2005), 'Diesel cars without filter lose value rapidly' (*Spiegel online*, April 11, 2005), 'Particle filter regulation puts pressure on automobile banks and leasing firms' (*Handelsblatt*, May 3, 2005). This media coverage on the depreciation of cars without DPF provided the final step towards the emergence of the filter as a de facto standard. The demand forced the car manufacturers to equip their cars with DPF: they began announcing that the DPF

would become a standard for their entire fleet, even before any regulation was passed. For example, GM-Opel announced that the DPF would be a standard in Germany in July 2005, Toyota in May 2005, and Ford in August 2005:

> Beginning this summer, Mercedes-Benz will equip all its diesel passenger cars sold in select countries with a particulate filter as standard. It will be the first automaker to do so. The diesel initiative, announced by Dr Eckhard Cordes, the Head of the Mercedes Car Group, initially applies in Germany, Austria, the Netherlands and Switzerland. A total of 30 different models are affected. (*Green Car Congress*, March 2005)

> Toyota will offer its Avensis with a diesel particulate filter by early next year. It is also likely Toyota will provide soot filters on its low-end diesel models in Germany and neighbouring markets because consumers there demand them. (*Just-Auto*, May 31, 2005)

> Ford…is making Diesel Particulate Filter (DPF) systems available across the heart of its vehicle portfolio – including retro-fit systems for the majority of diesel-powered Ford vehicles already in customer's hands. New Ford Motorcraft retro-fit systems will be available to suit a wide range of older Ford models. (Media.Ford.com, August 2005)

Car manufacturers who did not have contracts with DPF suppliers feared that their share in the diesel car market might drop and had to invest heavily in increasing supplier capacity. Indeed, the problem was that, even though the car manufacturers wanted to offer DPFs, there was not enough supply to equip the large annual volume of German diesel cars.

Initially, the government thought that introducing a tax incentive could be a viable option, but the trend of the market was suggesting that there was no longer a need for this:

> The idea was to give a tax incentive to customers, but in the end there was no need because if the market for diesel cars without filter vanished it would have been useless [to provide incentives]. (Government representative, interview 2010)

Key citations for this phase are shown in Table 5.

Phase analysis. In this last phase, the local objectification of the proponents' 'depreciation of cars without filter' frame started to affect the customers' purchasing behaviour and attracted demand for cars with DPFs. Crucial in this phase and what brought about the emergence of a de facto standard was the mobilization of critical actors who could exercise their power (here purchasing power). It is worth noting that the proponents sharpened the frame 'economic value of the car' increasingly over time. The framing started from 'cars without filter will lose value' and ended in the notion that reselling cars without DPF might become almost impossible in the near future.[2] Because they conveyed risk of losing money, these frames resonated with the customers' values, especially for the big leasing companies.

When customers exercise their purchasing power, they leave the automotive industry with two choices. Either the industry can comply with customers' requirements, the market logic commanding companies constantly to adjust to demand in order to secure revenues for the firm, or the firms can ignore the signals sent by customers, running the risk of going out of business. In any case, the customers' purchasing power and the business decision to comply with, ignore or deny that market demand take place within power contests where critical actors decide to allocate resources where they are needed. The turning point is reached when the number of critical customers demanding a DPF reaches a certain threshold and in our case this was expressed by the proposals that car manufacturers

make the DPF a de facto standard for their model, without the need for legal enforcement. Following the demand for DPF, car manufacturers agreed to install the technology on their diesel cars.

Analysis

From the findings of our case study, we developed a dualistic process model of institutional emergence. Our model, shown in Figure 1, consists of four phases each characterized by specific contests and specific turning point mechanisms (large arrows in Figure 1). In each phase, the frames or mobilization efforts of the challengers have to reach a certain threshold in order to become a turning point critical for the next framing contests to occur, which feeds the next phase. Our case suggests that there are three types of turning point mechanisms: (1) local objectification; (2) movement legitimacy; and (3) mobilizing critical actors. Each of these mechanisms contributes to producing the transition between phases in our case example. We begin by presenting the phases involved for a new institution to emerge and then discuss the role of turning point mechanisms in the process.

The first phase is characterized by an initial contest, which mainly involves the deployment of diagnostic (identifying problems) and prognostic frames[3] (proposing solutions) by the challenger of the status quo, and of counter-frames by the defenders. Identifying a problem, proposing a solution and the crafting of counter-arguments are the basic necessary ingredients for an initial contest to last over time and to evolve to the second phase, the constitution of a social movement and the appearance of legitimacy contests.

In the constitution of the social movement, proponents of change attempt both to mobilize homogeneous actors in order to expand their influence, such as the 97 NGOs in our case, and to deinstitutionalize (having actors joining the movement) central actors who are part of the defenders of the status quo. In reaction, defenders buffer the attack of the challengers of the status quo by disciplining (Foucault, 1977) those who are willing to join the effort of the social movement and by de-legitimizing the movement, i.e. attacking the credibility of the movement (we further develop this argument in the next section). Attempts to deinstitutionalize the defenders and de-legitimize the movement constitute a legitimacy contest. However, efforts at deinstitutionalizing the defenders or convincing the defenders of the status quo to change may not be sufficient for the new institution to emerge if the buffering mechanism of the defenders is effective. This encourages the social movement to use frame transformation (Snow et al., 1986) in order to convince other actors who had not felt concerned by the debate thus far.

Frame transformation marks the beginning of the third phase, which is mainly characterized by developing motivational frames, reflected in our case by the elaboration of economic frames taking the form of the value of the car and tax incentives in order to increase the sensitivity of or to motivate some actors who are critical of the emergence of novel institutions. Not surprisingly, these motivational efforts by the social movement are counter-framed by the defenders of the status quo. This constitutes motivational contests wherein proponents and opponents of a new norm attempt to mobilize critical actors, customers and, in our case, the government.

In the fourth phase, the activities of the social movement and of the defenders of the status quo lead to mobilization contests as both parties attempt to draw customers and the government on to their side. If critical actors take action, a normative institution emerges, a de facto standard in our case. However, the emergence of a normative institution does not mean that a consensus was reached (Tolbert & Zucker, 1996) or that a synthesis emerged (Hargrave & Van de Ven, 2006). In a dualistic process model of institutional emergence, the norms emerge, as in our case, out of the coercive action of one group over another. In our case, the purchasing power of important

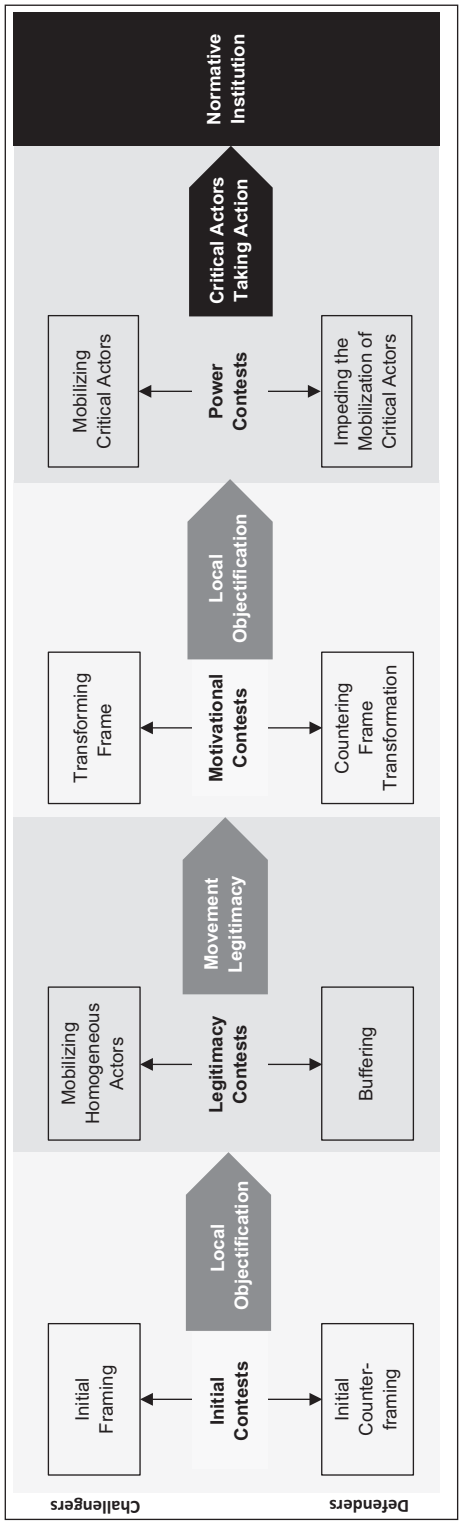

Figure 1. Dualistic process model of institutional emergence.

customers forced the industry to react even though the latter did not believe in the necessity or the effectiveness of the DPF.

Turning Point Mechanisms

The described phases represent the major building blocks of the proposed model. Frames and mobilization activities, however, must reach a certain threshold[4] in order to become a turning point mechanism for further contests to occur. Specifically, our case study results suggest three types of turning point mechanisms which provoke new contests and which ultimately lead to institution emergence. The fact that frames and mobilization activities can become turning point mechanisms is always subject to the counter-force of the frames of the defenders of the status quo.

The first important turning point mechanism is *local objectification*. It manifests itself in the production of consensually perceived evidence that a frame is tangible. As long as this local consensus is not reached, frames may be considered as being merely speculative. In our case, the frame 'benefits of the DPF' was vulnerable to the 'technically infeasible' frame articulated by the car manufacturers until the manufacturer PSA presented a car with the DPF: this constituted the first evidence of the DPF being a socially recognized fact. The frame 'benefits of the DPF' reached local objectification when additional evidence was generated by ADAC and reified by the members of the still embryonic social movement. In the third phase, local objectification was also reached by the frame 'economic benefits of the DPF' when the report produced by EurotaxSchwacke was released which estimated that cars without a filter would lose value, and when the information it contained was distributed by the social movement. This last motivational frame played a crucial role in mobilizing consumers. One reason is that, while the social movement could substantiate their claim with the reports from EurotaxSchwacke, this frame was only weakly counter-framed by the automotive industry. They counter-argued merely by denying the arguments of the environmental movement, defending the position that not having a filter did not affect the value of diesel cars. The local objectification of the third phase was particularly crucial because it brought a change in those who had the power to alter things, i.e. customers. It actually changed customers' norms, notably in the leasing companies, as they began asking for DPFs when buying diesel cars in order to avoid losing money.

As can be seen after the first phase, the social consensus about the evidence of the effectiveness of the DPF is not sufficient. Those who are providing evidence have to be perceived as having moral legitimacy (Suchman, 1995), i.e. perceived as being appropriate to produce evidence, in order to elaborate those frames. Without such legitimacy, the evidence is likely to be considered peculiar or anecdotal at best. For example, if Greenpeace had produced evidence that filters are effective, it is unlikely that the frame 'benefits of the DPF' would have mobilized actors. In the past, Greenpeace had produced a car prototype called the Smile car that consumed less gasoline and it was immediately discredited by the automotive industry. PSA in commercializing the product and ADAC as testers of the filter have the legitimacy to produce such evidence in order for this frame to reach local objectification.

The second turning point mechanism observed in our case study concerns the *legitimacy of the movement*. The movement became legitimate when it gained credibility in the eye of several constituencies of society, especially homogeneous actors and those concerned with the problems and solutions framed by the social movement. In our case, several indications show that the movement reached moral legitimacy, i.e. was perceived as appropriate (Suchman, 1995). One indication is the composition of the social movement. The fact that highly credible organizations such as the World Health Organization and a children's advocacy association, which are not environmental NGOs (though still NGOs), is a sign that the social movement gained substantial legitimacy. Indeed, it is

not only the mere number of NGOs joining the movement which indicates legitimacy, but also which actors join the movement. Having these two non-radical organizations (den Hond & de Bakker, 2007) joining the movement clearly supported the legitimacy of the cause. Our results suggest that once a movement gains moral legitimacy it has the strength to transform its initial frames into others as a means to mobilize a larger array of actors. Frame transformation is the term coined by Snow et al. (1986) to express the redefinition of the values and meanings of one frame into another. Before a social movement reaches moral legitimacy, it is unlikely that frame transformation will be effective because actors may perceive the movement as marginal and as not having the credibility to make some frames resonate. While the concept of legitimacy has rarely been applied to social movements, the finding that activists need legitimacy in order to be sufficiently influential to promote and replace new logics and identity is not new (Rao et al., 2003). In their paper, Rao et al. (2003, p. 804) show that 'nouvelle cuisine was promoted by activists in the centre of the French culinary world' by those who were already perceived as legitimate in orthodox cuisine, and that this involvement was crucial for the nouvelle cuisine social movement to take form.

The third turning point mechanism of our model is *critical actors taking action*. When direct action inviting the defenders of the status quo to change fails, direct action against the defender may not be the best course. Instead, mobilizing critical actors such as consumers or the government, having some power over the defenders of the status quo, is crucial. Critical actors are those who have the necessary power to make the defenders of the status quo reactive in the direction of the claims of the social movement. Mobilizing organizations having power – even if this power is highly distributed as in the case of several customers asking for a technology (Ansari & Phillips, 2011) – is necessary to create the bandwagon for a normative institution to emerge. In this perspective, power can take several forms such as resource dependence (Pfeffer & Salancik, 1978) or a coercive one (DiMaggio & Powell, 1983). Once some critical actors are mobilized, other critical actors can follow, thereby reaching the point where a critical mass of actors embraces the emerging norm by taking action. In our case, the critical actors were the leasing and logistic companies asking for their fleet to be equipped with a DPF, and other consumers taking action by demanding that their cars have the same equipment. To avoid losing their market share, car manufacturers had to adjust quickly and those who did not have contracts with filter suppliers lost out. Due to the demand for a DPF, car manufacturers began offering this equipment as standard on diesel cars; the technology became a de facto standard.

In order to provide additional support to the turning points we observed, we performed an automated analysis of articles in order to observe the outcomes of the three different turning point mechanisms in the case. As shown in Figure 2, the initial frames of the environmental NGOs met with relatively little interest in the media. The media attention peaks slightly in response to the results of the ADAC study (around August 2001), yet the movement itself and its major public health frames are hardly noticed. At the point where the NGOs forge a coalition (after the Bundestag election in autumn 2002) and use the locally objectified frames (by PSA and ADAC) to mobilize, they gain the legitimacy needed to disseminate their frames on a larger scale (peak of the 'social movement' theme around November 2002). Later, the local objectification of the 'public health' frame (around July 2003) as well as the transformed frames 'value of the car' (around September 2003) and 'regulatory intervention' (around June 2004) led to smaller peaks in published articles. However, in order to move forward, the movement had to pick these objectified frames up and mobilize. And indeed, Figure 2 shows for the time around March 2005 that the movement received massive media attention together with its two frames, 'value of the car' and 'regulatory intervention', which ultimately affected the critical actors' behaviour and brought about institutional emergence.

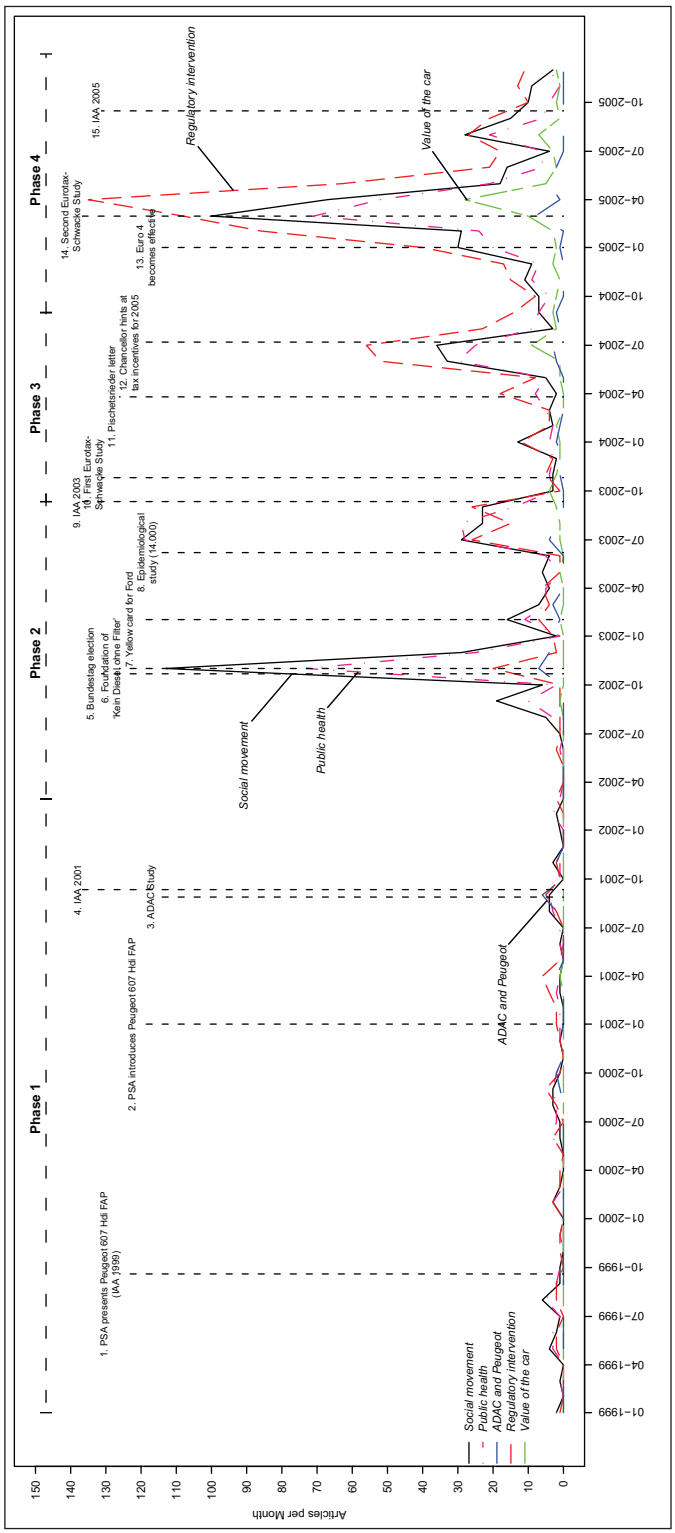

Figure 2. Timeline, main events, and the media coverage of important frames over time.
Note. Articles were binary coded for each variable ('1' if a word of the corresponding dictionary appears in the article, '0' otherwise). Then, these data were aggregated to monthly sums. To check the robustness of the results, other coding approaches were used (total count of words per article, logarithm of count of words per article); however, the shapes remained robust.

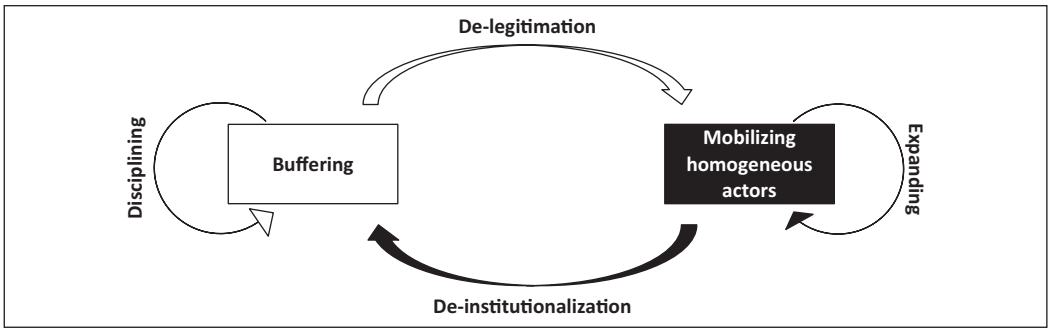

Figure 3. Mechanisms involved in legitimacy contests.

Buffering strategies

Our model shows that the second phase characterized by legitimacy contests features an attempt by the social movement to *expand* its membership in an attempt to mobilize institutional actors and to *deinstitutionalize* (den Hond & de Bakker, 2007) some members among the defenders of the status quo; i.e. to recruit some of them to join the movement (refer to the black arrow and the black box in Figure 3). Figure 3 provides an overview of the different elements of the legitimacy contests and the buffering behaviour of our model.

The divide-and-conquer strategy used by the social movement may trigger buffering strategies from the defenders of the status quo which are characterized by *disciplining* and *de-legitimation*. Disciplining is the call for unity among the troops in order to avoid sanctions. The way discipline is exercised in our case is a form of coercion with the aim of making sure that an entity will be sanctioned if it defects to its peers. At the same time, the defenders of the status quo attempt to de-legitimize the challengers by attacking their identity and their cause. By de-legitimization we understand attempts to discredit an individual, a group, an organization or a social movement. These attacks and counter-attacks constitute the foundation of the legitimacy contests at the heart of the second phase of our model. In our case, disciplining took the form of threatening Ford Germany that they would no longer be invited to industry meetings, and de-legitimizing the challengers by accusing the social movement of panic-mongering. Both disciplining and de-legitimizing the challengers constitute two important tactics of the buffering mechanism.

Depending on the characteristics of the emerging institution and the setting this dualistic process model attempts to explain, several variations of the model may be observed. Phases may occur simultaneously since framing and mobilizing activities may be concomitant instead of sequential. We may expect simultaneity to occur in periods of acute crisis. Mirroring the phases, turning point mechanisms may also take place simultaneously, reinforce each other or appear in a different order. Other turning point mechanisms may be involved depending on the context of the framing contests. Several iterations of frame transformation may also be observed if conflicts around an issue do not evolve toward a temporal settlement.

Discussion

A dualistic process model of institutional emergence is a promising explanation for institutional emergence in conflictual situations involving highly dichotomized parties that allow

no possibility for a consensus to emerge (either because the antagonists defend irreconcilable positions or because there is no possible intermediate solution to a problem). Dualism refers to the fundamental opposition between parts of a whole. Accordingly, the model reflects the fundamental opposition between proponents and opponents of the development of new institutions that does not rest on the emergence of a synthesis or a consensus, but on the coercion exerted by one group of actors over another. This model is characterized by power and conflicts, which materialize in multiple framing contests which are punctuated by turning point mechanisms: local objectification, movement legitimacy and critical actors taking action. It also takes into account the buffering strategies deployed by the defenders of the status quo to protect themselves from the aggression of the social movement.

In the model, power plays a particular role as it is not only the ingredient that allows actors to engage in challenging the defenders of the status quo, but it is also the element that allows the defenders finally to embrace the desire of the challengers, not because they consensually agree with their requirements, as is the case in a dialectical model of institutional innovation (Hargrave & Van de Ven, 2006), but because they are forced by economic coercion. In our case, it is the purchasing power of consumers which made the industry adopt a de facto standard. Those who did not adopt would face competitive disadvantages and losses in market share. From this perspective, coercive power does not lead to synthesis or increased objectification, but to a forced settlement, which does not make unanimity among the defenders of the status quo. An important implication of this model is that it allows us to take into account not only power and conflict, but also their different manifestations and complexity along the emergence of institutions. Because power and conflict are omnipresent, the model can also easily account for failure of institutionalization projects. This can be explained by the failure of turning point mechanisms to reach a critical threshold (i.e. the lack of local objectification, of movement legitimacy, of the involvement of critical actors) or by strong buffering strategies that inhibit the mobilization efforts of a social movement.

Like the dialectic model of Hargrave and Van de Ven (2006), a dualistic process model of institutional emergence considers power and conflict as central, but it also takes into account the measure of local phenomena, i.e. occurring on one side of the interaction. Power is not given but has to be built up through framing activities or mobilization efforts towards a threshold where they become turning point mechanisms that mobilize more adherents to a cause and lead eventually to institutional emergence. Power is also manifest in attempts of the defenders of the status quo to buffer the challengers by using different tactics such as de-legitimation or disciplining. By elaborating such a model, which takes into account situations of institutional emergence wherein extremely polarized parties confront each other, we respond to the call for more work on extremely dichotomized conflicts (Greenwood et al., 2002).

Turning Point Mechanisms

Our dualistic process model of institutional emergence uses and extends the notion of turning points (Abbott, 1997) by introducing the concept of turning point mechanisms. While the concept of turning point is rather descriptive, we believe that by documenting its implied mechanisms we increase the explanatory power of the concept. The implication for research in institutional theory and the social movement literature is important because it allows capturing in one concept the key elements that are pushing a process in a new direction and enables explanation of shift occurrence in stage-like models.

One key turning point mechanism that is part of a dualistic model of institutional emergence is the concept of *local objectification*. Contrary to the notion of objectification, which implies the building of an increased general consensus about the value of an innovation among a population of

actors (Berger & Luckmann, 1967; Tolbert & Zucker, 1996), local objectification in a dualistic process model does not involve a generalized consensus, but rather the distributed perception by different groups of actors that a frame is substantive to various degrees. This is much narrower in scope as it targets only those who are likely to join a movement or to become activists. The concept of local objectification is bound up with the notion of framing contests. It is because there is a contest of the validity of some evidence that objectification is localized to those who are likely to buy in to what is proposed by the challengers of the status quo. By considering the defenders of the status quo as well as their challengers, a dualistic process model of institutional emergence can capture what it is that is becoming objectified for each party involved in framing contests. This suggests that it is characteristic of turning point mechanisms that they are often local, i.e. they can be circumscribed to some individuals, networks, organizations or social movements.

Moreover, *local objectification* does not necessarily constitute a final product or a state to be reached, but is a central mechanism for further mobilization to occur. In a sense, it is a necessary condition for the conflict to be sustained and evolve. The reason is that frames must be consensually seen not merely as speculative, but as being grounded in some evidence, and that this evidence should be perceived as valid by some actors who would have an interest (DiMaggio, 1988) in believing in it or have their ideology aligned with it (den Hond & de Bakker, 2007). Local objectification is echoed in other studies. For example, Rao et al. (2003) showed that the emergence of nouvelle cuisine in France was influenced by the evidence provided by the success of famous chefs who switched to this new way of preparing food. One may think of the success of these famous chefs as a frame which became locally objectified and thus allowed wider mobilization to occur and institution to emerge. On the other hand, more traditional chefs were denying nouvelle cuisine as an option for them.

Another turning point mechanism is movement legitimacy. While this notion is not new (Zald & Ash, 1966), it is the locality of the legitimacy that has implications for research. Because the defenders of the status quo are fighting to de-legitimize the movement, the latter has to constantly find a way to anchor its legitimacy in society in order to increase or maintain it despite the actions of the defenders of the status quo. Thus, movement legitimacy is an ongoing project that has to be constantly reaffirmed in order to convince at least some other social movement organizations that the cause it defends is worthy.

Critical actors taking action constitutes another turning point mechanism that is part of our model. The turning point mechanism nicely complements the notions of tipping points (Gladwell, 2000; Schelling, 1971, 1978) or threshold (Granovetter, 1978; Granovetter & Soong, 1983, 1986, 1988). While these concepts are mainly used to explain the final decisive moment when a system tips, they neglect all the sinuosity of the processes that take place before a major shift occurs. Furthermore, while these concepts attempt to link both the micro and macro levels of analysis, a tipping point or threshold is, at its end, essentially a micro-phenomenon as it is situated within the person and is influenced by the number of previous adoptions. The notion of turning point mechanism is situated at a more macroscopic level of analysis since it explains shifts occurring in a process, although these changes of direction may be local. Furthermore, a turning point allows us to account for more minor shifts that occur before a major change in a system. This has considerable implications for institutional theories because most institutional models attempt to make broad and encompassing models that do not account for local deviation from mainstream events when we know that it is precisely these local deviations that may bring about large-scale change over time. Finally, we would like to underline that a dualistic model of institutional emergence suggests that, as in the work of Gladwell (2000), having critical actors involved in pushing for a solution by taking action is extremely influential in producing institutional change or institutional emergence. It is not only a matter of numbers, as often implied in the classical concepts of threshold and tipping points.

Buffering Strategies

While the study of activists' actions (den Hond & de Bakker, 2007) and of social movements (McAdam, McCarthy, & Zald, 1996a; McAdam & Scott, 2005) has been extensively documented, less studied is the response behaviour of those undergoing an attack from social movements over time (Hardy & Maguire, 2008; Schneiberg & Lounsbury, 2008). Our analysis suggests that the defenders of the status quo resort to *buffering* strategies to resist the pressure unleashed by the challengers.

Initially proposed by Thompson (1967) to explain how organizations create different departments to protect their technical core, the idea of buffering has been used in many other settings to qualify how organizations protect or insulate themselves from environmental disturbances (Bode, Wagner, Petersen, & Ellram, 2011; Fennel & Alexander, 1987; Miner, Amburgey, & Stearns, 1990; Oliver, 1991). However, and to the best of our knowledge, this concept has not been used to describe the behaviour adopted by a whole industry in order to safeguard its integrity. The buffering mechanism we observe in our study is present in the repeated attempts of the industry to counter-frame the arguments of the social movement and is particularly acute in the second phase of our dualistic process model of institutional emergence, where legitimacy contests dominated the scene.

Relationships to Other Models

The dualistic process model of institutional emergence complements existing models of institutional emergence. We can distinguish three types of such models: the increased objectification models, the institutionalization of conflict models and the political models. Because our model accounts for multiple framing contests and is therefore based on conflict, the dualistic process model of institutional emergence is distinct from models which are based on the assumption that institutional emergence is the result of an increased consensus (den Hond & de Bakker, 2007; Greenwood et al., 2002; Marichal, 2009; Tolbert & Zucker, 1996). Indeed, the increased objectification models are based on the idea that a consensus arises from the emergence of a shared understanding, while in a dualistic process model there is no consensus but a winning camp imposing its will.

It is also distinct from the studies that attempt to understand how competing logics or framing contests emerge and become institutionalized. These studies show that institutional fields are pluralistic and that, when there is no possibility of framing contests being resolved, the conflict can be institutionalized, taking the form of competing institutional logics (Dunn & Jones, 2010; Purdy & Grey, 2009; Scott, Ruef, Mendel, & Caronna, 2000). A dualistic process model of institutional emergence differs from these models because, while the arguments of the party which loses the battle cease to have an active role in the social arena, these arguments continue to be alive in the belief system of the defenders of the status quo. Observing a temporary settlement does not mean that a consensus is reached, but rather that a temporal solution has been imposed.

Finally, the political models are closer to the dualistic process model of institution emergence because they explicitly theorize the role of conflict and politics in institutional emergence. The dialectic model of institutional innovation (Hargrave & Van de Ven, 2006) is based on a Hegelian opposition between thesis and antithesis, where the outcome of a confrontation or a contest is a synthesis that constitutes the new material for a new confrontation to take place. Because the elaboration of a synthesis constitutes the key moment of conflict resolution, the dialectic model assumes that the conflict may be resolved at the end by consensus. The den Hond and de Bakker (2007) model also involves the resolution of institutional emergence through consensus as the last phase of institutionalization, deinstitutionalization and reinstitutionalization, i.e. a return to a

normal situation where past conflicts are overcome. The Schneiberg and Soule (2005) model, which elaborated a contested multilevel process model, shares one assumption with ours in that the resolution of framing contests is no more than a temporary settlement where new cycles of protest are to be constantly expected (Tarrow, 1989, 1998).

A dualistic process model of institutional emergence differs from all these models for several reasons, with crucial implications for research. It conceptualizes the emergence of an institution as a series of framing contests punctuated by several turning point mechanisms tending to have a localized effect, i.e. on one side of the interaction. This has serious methodological and conceptual implications as it forces researchers to broaden the scope of their investigation by analysing and theorizing the activities and behavioural repertoires not only of challengers but also of defenders of the status quo. It also shows that institutional and political processes are tightly intertwined and that, despite the input of so-called cultural frame institutionalism, more work is required in this direction to have a better understanding and a wider mapping of the mechanisms that explain observed turning points.

Conclusion

Responding to the call of scholars for more work on the role of social movements in institutional emergence (Hardy & Maguire, 2008; Schneiberg & Lounsbury, 2008), this study examined how proponents and opponents of the introduction of a new norm engage in framing contests over time. To address this issue, we drew on an in-depth case study of the emergence of a de facto standard, namely the diesel particulate filter (DPF) for diesel cars in Germany. By developing a dualistic process model of institutional emergence, this study makes three contributions to the institutional literature. First, we show that turning point mechanisms are central to understanding how framing and mobilization activities of a social movement can push their cause forward in order to shape the next phase, which can eventually lead to institutional emergence. Second, our results suggest that those under fire from a social movement tend to deploy buffering strategies to protect themselves from external aggression. Third, we show that institutional emergence may be the result of the power exercised by critical actors responding to the imperative of a social movement.

More work is needed to test the robustness of the dualistic process model of institutional emergence. In the same vein, more studies should examine how proponents and opponents of a cause engage framing contests and how these conflicts are maintained over time or are resolved when actors have extremely divergent interests. There is an acute need for further empirical studies to document and better understand how the strategies, tactics and action of the challengers and defenders of the status quo relate to one another. As it stands at this moment and as Hoffman (2011) observed for his studies on climate change, the literature tends to assume that the strategies of the challengers of the status quo are independent from the action of its defenders. As such, we also call for more work documenting the reaction of those under fire from social movements and more specifically the forms that buffering strategies can take in different settings. We also call for more work documenting the forms and shapes that turning points may take in different cases of institutional emergence and the underlying mechanisms explaining shifts from one stage to another. Finally, we would like to see more explorations of the processes of institutional emergence that do not assume that a general consensus constitutes the underlying mechanism.

Because our case study and our analysis investigated framing contests and different turning point mechanisms in detail, we believe that our results can be generalized to other similar settings. More specifically, we believe that our results can be generalized to settings characterized by intense

schisms between proponents and opponents of a cause, where the establishment of a consensus over a norm or a standard is highly unlikely. Settings where green technologies are promoted by activists, such as the case of the catalytic converter in the automotive industry (Wurzel, 2002), the photovoltaic technology in the energy sector, the commercialization of nanotechnology, and battles between environmentalists and the oil industry for lead-free and sulfur-free fuel, are likely to be characterized by a dualistic process model of institutional emergence. In a world featuring several divergent interests where deadlocks often dominate the scene, a dualistic process model of institutional emergence may help to find ways to institutionalize solutions without having to wait for an institution to emerge out of a consensus.

Appendix. Dictionaries used for Automated Text Analysis.

Theme	Scope	Dictionary (in German)
Social movement	Covers the names of all major actors of the pro-DPF movement and their key slogans (e.g. 'DUH', 'No Diesel without Filter')	bund fuer umwelt und naturschutz deutschland; duh; feinstaubalarm; feinstaubkatastrophe; feinstaubproblem; filterfrage; friedrich; greenpeace; gsf; kein diesel ohne filter; lottsiepen; nabu; naturschutzring; resch; russproblem; uba; umweltbundesamt; umwelthilfe; umweltorganisation; umweltschuetzer; umweltschutzorganisation; umweltverband; vcd; verkehrsclub deutschland; weltgesundheitsorganisation
Public health	Covers terms identified to deal with the negative health effects of diesel PM (e.g. 'lung cancer', 'cardiovascular')	atemwegserkrankung; blutbahn; blutkreislauf; gesundheitsgefaehrdung; gesundheitsrisiko; gesundheitsschaedlich; herzinfarkt; herzkreislauferkrankung; krebs; krebsausloesend; krebserkrankung; krebserregend; krebserzeugend; krebsfoerdernd; krebsgefaehrlich; krebsgefahr; krebsrisiko; krebstote; krebsverdaechtig; lebenserwartung; lunge; lungenabwehr; lungenblaeschen; lungenkrebs; lungenkrebsrisiko; todesfaelle; toetet; tote
ADAC and Peugeot	Covers terms that represent Peugeot (the French OEM who introduced the DPF technology) and ADAC (the automotive club that ran the first tests)	citroen; eolys; fap; filtre; particules; peugeot; psa; adac; allgemeine deutsche automobil club; allgemeiner deutsche automobil club
Regulatory intervention	Covers terms identified to deal with the idea of regulatory interventions favouring the DPF (e.g. 'tax incentives')	filterfoerderung; filterpflicht; foerderbeschluss; foerdergesetz; foerderkonzept; foerdern; foerderplan; foerderung; filterpflicht; steueranreiz; steuerentlastung; steuererleichterung; steuerfoerderung; steuervorteil

Appendix. (Continued)

Theme	Scope	Dictionary (in German)
Devaluation of cars without DPF	Covers terms identified to indicate the risk of future devaluations of cars without DPF (e.g. 'residual value', 'new cars without')	abschreibungsbedarf; an wert; eurotax schwacke; eurotaxschwacke; eurotax-schwacke; gebrauchtfahrzeugrestwert; gebrauchtfahrzeugwert; gebrauchtwagenrestwert; gebrauchtwagenwert; neuwagen ohne; preisverfall; restwert; restwertkalkulation; schwacke; verelli; verrelli; wertkorrektur; wertverfall; wertverlust; wiederverkaufswert

Note. For the analyses, we used the scripting language *Perl* and the statistics software *R*. Besides the five themes shown, several other themes were analysed. All terms were converted to lower case and umlauts were substituted appropriately. Then, terms were stemmed (using a German Porter stemmer) and regular expressions were used to capture word variations.

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Notes

1. According to Soule (2004) the only distinction between the concepts of framing and theorization is that theorization specifies who should adopt an innovation. We draw on both ideas in this study.
2. It should be noted that several suppliers offered affordable DPF retrofitting kits. However, these kits attain only 30 to 40 percent of the effectiveness of original equipment DPFs. For this reason, retrofitting was not an option to circumvent economic losses in case of tax incentives that are connected to tight PM emission limits.
3. Note that motivational frames are also present, but do not dominate the scene (see Figure 2).
4. Please note that we do use the term 'threshold' in the same way as Granovetter (1978) (see our comment in the discussion section).

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